STATEMENT OF WORK
For
SYSTEMS UPGRADE IN SUPPORT OF THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION OCEAN SURFACE TOPOGRAPHY MISSION

September 19, 2005

Prepared by
DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

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U.S. Department of Commerce
National Oceanic and Atmospheric Administration (NOAA)
National Environmental Satellite, Data, and Information Service (NESDIS)

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Preface

DESCRIPTION/SPECIFICATIONS FOR STATEMENT OF WORK

The Contractor shall provide services, personnel, material, and equipment necessary to support the National Oceanic and Atmospheric Administration (NOAA) in its endeavor to upgrade the NOAA Polar Ground Segment (NPGS), in preparation for participation in a research to operations transition of the Ocean Surface Topography Mission (OSTM). The OSTM system is comprised of a space segment/remote sensing environmental satellite (Jason-2), as well as a ground system composed of multinational ground segments for mission control and operations, data processing and data/products archiving. The Contractor effort essentially entails system integration, verification and deployment of the government-furnished equipment (GFE) Jason-2 system hardware and software with existing NPGS elements.

This document comprises the NOAA/NESDIS baseline publication of the Statement of Work for Systems Upgrade in Support of the National Oceanic and Atmospheric Administration Ocean Surface Topography Mission. This document is Revision 0, DCN 0 (document number No-NOAA-Polar-OSTM/OSD-2005-0003R0UD0).

Future updates and revisions to this document will be produced and controlled by NOAA/NESDIS/OSD.

1 INTRODUCTION

NOAA's National Environmental Satellite, Data and Information Services (NESDIS) has entered into an agreement with the National Aeronautics and Space Administration (NASA), the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT), and France's Centre National d'Etudes Spatiales (CNES) for participation in the Ocean Surface Topography Mission Jason-2 (OSTM/Jason-2). The four partners will collaborate to develop, implement, launch, and bring to full operational status a satellite and ground system that has payload instrumentation appropriate for continuing the TOPEX/Poseidon and Jason-1 missions, in order to collect measurements of sea surface height, significant wave height, wind speed at ocean surface, and other related parameters.

The launch of the Jason-2 satellite is planned for June 2008. The Jason-2 planned operational lifetime is three years, with an extended lifetime of two years.

NOAA anticipates awarding a single Cost plus Award Fee Performance Based Contract (PBC) for the entire scope of work/effort as detailed in this Statement of Work (SOW) and applicable documents listed in Table 1-2. The award fee plan and citeria for the NOAA OSTM/Jason-2 Project are outlined in separate attachments.

The primary (basic) effort of this contract entails the following:

a) Integration and verification of the government-furnished equipment (GFE) "Jason Telemetry, Command and Control Subsystem (JTCCS)" software with the NOAA Satellite Operations Control Center (SOCC) and NOAA Command and Data Acquisition Stations (CDAS).
b) Integration and verification of the GFE "Data Processing System (JSDS)" with the NOAA Environmental Satellite data Processing Center (ESPC). Note that this effort is an optional portion.
c) Installation of a Data Communications Network (DCN) for Jason-2 data exchange, among NOAA functional centers or elements, as well as a link between NOAA SOCC and EUMETSAT in Darmstadt, Germany. Note that this effort is also an optional portion.
d) Verification of the "Integrated NPGS", to validate the NPGS internal and external interfaces compatibility and operational performance.
e) Certification and Accreditation (C&A) support to ensure the information and Information Technology (IT) system components are properly protected.

The award of the contract is subject to NOAA and other Government funding approvals for the project. This task will be managed and coordinated by the Jason-2 Project Manager within the NOAA/NESDIS/Office of Satellite Development (OSD)/ Polar Program/Jason-2 Management Office.

As noted previously, NOAA has identified two optional portions. It is requested that the bidders appropriately itemize the costs for the primary and each optional portion of the work/effort separately, in their cost proposals. The Government, at its discretion, will decide about exercising the options after reviewing relevant information.

NOTE: Jason-1 may be referred to as "Jason" in NASA/Jet Propulsion Laboratory (JPL) documents, and the OSTM/Jason-2 is synonymous with just "Jason-2" in this document.

1.1 Purpose

The purpose of this SOW is to define and describe the tasks, services and deliverables expected from a Contractor to NOAA as part of this contract, to build and/or upgrade the NOAA Polar Ground Segment (NPGS) to support the OSTM/Jason-2 system and services. In addition to requirements in this SOW, the OSTM/Jason-2 ground system requirements are defined separately in NOAA Polar Ground Segment Requirements for the Ocean Surface Topography Mission (OSTM) [AD-1].

1.2 Background

The successes of both Ocean Topography Experiments TOPEX/Poseidon and Jason-1 satellites have demonstrated that radar altimetry data plays an important part in oceanographic studies. Within the U.S. Government, NOAA has the overall responsibility for the establishment and operation of civilian satellite systems for the collection of environmental data in support of its strategic goals and objectives.

NOAA's objective is to maintain service continuity of the TOPEX/Poseidon and Jason-1 programs. This objective will be achieved based on NASA/CNES Jason-1 experiences and using hardware/software developed by those agencies. The hardware/software will be integrated and upgraded within the existing functionalities of the NPGS.

1.3 OSTM/Jason-2 System Overview

The OSTM will include a satellite—Jason-2—consisting of a satellite-bus (the PROTEUS platform and a payload module) to be provided by CNES, and payload instruments jointly provided by CNES and NASA. The instruments on Jason-2 consist of the Poseidon Altimeter, the Doppler Orbitography and the Radiopositioning Integrated by Satellite (DORIS), both provided by CNES, and the Advanced Microwave Radiometer (AMR), the Global Positioning System Payload (GPSP) receiver package and the Laser Retroreflector Array (LRA) to be provided by NASA. NASA will also provide launch services for the mission. EUMETSAT will provide a dedicated remotely operable Earth Terminal (ET) at Usingen, Germany, that will be controlled and operated remotely by NOAA.

The overall mission is distributed over six phases namely:

- Launch and Early Orbit Phase (LEOP) – This phase includes launch readiness, launch (L) and orbit injection. Spacecraft and instrument systems are activated and checked out (~L+3 days).

- Orbit Acquisition Phase - The satellite is maneuvered into its operational orbit (~L+1 month). This phase overlaps the Assessment Phase.
- Assessment Phase - This phase begin at the end of LEOP and ends when the spacecraft and instrument systems are functionally certified, the satellite is in its operational orbit, and the ground system is ready for routine operation (~L+4 months).
- Verification Phase - This phase is concurrent with the Assessment Phase and continues until the data and processing algorithms are satisfactorily calibrated and validated (~L+1 year).
- Initial Routine Operation Phase - Operations begin after completion of the Verification Phase and continue for three years after launch, consistent with the three-year mission design life.
- Extended Routine Operation Phase - Assuming useful data is still being collected, this phase extends the mission to an additional two years beyond the initial routine operation phase.

The CNES Mission Operations Center will be the primary control center from the LEOP through the verification phases. CNES will also be responsible for coordinating and integrating the support of NOAA, EUMETSAT and NASA/JPL during those phases. The OSTM Ground System support includes the combined support of the CNES, NOAA, EUMETSAT, and NASA ground segment capabilities. Following the verification phase, the Jason-2 operations are handed over to NOAA by CNES for routine and extended period operations.

For NOAA, the Satellite Operations Control Center (SOCC), within the Office of Satellite Operations (OSO) will be the primary mission operations center. NOAA will operate and control the Jason-2 satellite during the routine operational phase with the support of CNES and NASA/JPL for mission planning and satellite monitoring. NOAA will also schedule and conduct satellite operations through the NOAA Command & Data Acquisition Stations (CDASs) at Wallops and Fairbanks, and will remotely operate through the Usingen ET. NOAA and EUMETSAT will store the downlink satellite telemetry and instrument data at their respective ground stations, process the near real time (NRT) science data and products, and make them available to partners and users. NOAA and CNES will provide long term archive and access services for the Jason-2 instrument raw data and science data products.

The primary NPGS external data network interfaces include the EUMETSAT and NASA/JPL. NOAA will also have communication links to CNES via EUMETSAT.

Overall responsibilities for operating the OSTM/Jason-2 satellite will be entrusted to NOAA. Currently, JPL and CNES operate the Jason-1 ground system, while NOAA and EUMETSAT are science data users. For Jason-2, the JPL's ground segment functions will be transferred to NOAA at their facilities in Maryland, Virginia and Alaska. The CNES data acquisition facility will be replaced by one operated by EUMETSAT at Usingen, Germany.

NOAA will assume responsibility for ground-system operations for the Jason-2 satellite after the handover from CNES at the end of the satellite on-orbit assessment and orbit acquisition. The overall NOAA/NESDIS responsibilities with respect to the Jason-2 are classified into the following four functional groups:

- **Telemetry, Command and Control (C2)** includes overall mission management, satellite operations and satellite data reception. These functions are primarily carried out by NOAA at SOCC.
- **Satellite Data Processing (DP)** includes mission/satellite data and products processing, both real-time and recorded data. The data processing functions and distribution to partners are performed by the NOAA Environmental Satellite data Processing Center (ESPC).
- **Archive and Access System (AAS)** essentially includes archiving the entire mission raw and processed data and makes it available to users. The archive functions are conducted within the NOAA Comprehensive Large Array-data Stewardship System (CLASS).
- **Data Communications Network (DCN)** provides the data communications network infrastructure for data exchange/distribution across the Jason-2 System. This will be managed by a network operations center with in NOAA/NESDIS.

1.4 Scope

The scope of this SOW includes all effort required to procure, design, implement, integrate and verify all Jason-2 requirements stated in this document and other applicable documents in Table 1-2. The scope applies to all Contractor project support tasks and items, procured under the OSTM/Jason-2 contract as stated in this document, including hardware/software systems, services, design, development, implementation, verification and validation, training, support tasks and final acceptance by the Government of the "Upgraded" NPGS. The NPGS functional centers (NPGS elements) primarily constitute the SOCC, Wallops CDAS (WCDAS), Fairbanks CDAS (FCDAS), ESPC, CLASS and DCN infrastructure. The scope also applies, as appropriate, to all NOAA procured and Contractor-delivered items and services based on the NPGS System Requirements for OSTM document.

NOTE: The scope of the contract effort includes a primary and an optional portion. Accordingly, the Contractor is requested to respond to each portion separately.

1.5 Baseline Approach

The overall Jason-2 operations, with respect to spacecraft and payload telemetry and commanding systems, will be very similar to the current JPL/Jason-1 operations. Further, NOAA has successfully tested the existing Jason Telemetry Command and Communications Subsystem (JTCCS) software, developed by JPL, for Jason-1 data acquisition at the WCDAS. The test verified functional compatibility of using JTCCS with the existing data acquisition capabilities at the WCDAS, and hence the JTCCS should also be compatible with a similar system at the FCDAS.

Based on this functional verification, NOAA envisions that this contract will basically entail the integration, verification and augmentation of the GFE with existing NPGS elements. Some development effort with respect to the GFE interfaces with existing systems, command sequencing and installation, operations and maintenance of the DCN, will be required. A list of the GFE by NOAA is provided in Table 1-1.

The Contractor shall be responsible to provide upgrades to the NPGS based on an implementation strategy. The NOAA conceptual architecture for the NPGS upgrades utilizes and augments existing NOAA functional and operational capabilities and systems.

NOAA Reference Concept includes the following:

- Consultative Committee for Space Data Systems (CCSDS) formatted data and processing hardware/software, existing at the CDA stations.
- NPGS will utilize WCDAS and FCDAS for Jason-2 command, control and telemetry operations.
- NPGS may use (share) Initial Joint Polar System (IJPS), existing secure communications service (GFE) between NOAA and EUMETSAT for distributing and retrieving satellite data and products. NOAA may exercise an option to acquire a new Jason-2 dedicated communications capability under this contract.
- NPGS will use secure Transmission Control Protocol/Internet Protocol (TCP/IP) communications capabilities at both NOAA and at EUMETSAT that satisfy existing security requirements for all partners as appropriate.
- NPGS will use/adapt the Jason-1 Telemetry, Command and Communications Subsystem (JTCCS), supplied as GFE.
- NPGS will use the Near Real-Time Data Processing System (NRTDPS) developed by CNES and provided as GFE, to process Operational Geophysical Data Record products.

Table 1-1 Government Furnished Equipment (GFE) List

Item #	Item Description	Comment
1	Jason Telemetry Command and Communications Subsystem (JTCCS) software. JTCCS is the main command/control software for the Jason-2 satellite.	May require some modification for Jason-2
2	JTCCS Development Environment: The JTCCS Development Environment consists of hardware and software tools, JTCCS Software, scripts to support JTCCS software development/modifications and building of the software from the source files.	
3	Jason Science Data Processing Subsystem (JSDS) consisting of Level 1 and Level 2 data processing system to process raw data to near real-time products. The CMA element collects the instrument data files and ancillary files, executes the science processing algorithms on the data and produces the science products (NRTs).	
4	EUMETSAT/European Earth Terminal (ET). This terminal will	Typical Leo-

	be fully automated and will consist of a 5-meter antenna, an RF subsystem, a baseband subsystem and a time and frequency subsystem. The ET is located at Usingen, Germany.	T Based 5-meter antenna system.
5	Five (5) 13-meter antenna systems comprised of five strings with each string consisting of a Left Hand Circular Polarization (LHCP) and Right Hand Circular Polarization (RHCP) receiver pair, a diversity combiner and a bit synchronizer. a) The 13 meter antenna with Tunable Universal Track Receiver (TUTR), a pseudo-monopulse track receiver capable of providing auto-track signals for receiving frequencies up to 3 GHz. b) The Bit synchronizers are capable of supporting data rates up to 5 Mbps, although receiver IF bandwidths limit the maximum ingest data rate to approximately 3 Mbps Bi-phase codes or 4 Mbps non-return-to-zero (NRZ) codes. Each bit synchronizer is capable of providing a times 1 (1x), times 2 (2x), or times 4 (4x) clock for any input data rate. Capable of transferring CADUs serially. c) L/S-Band Receiver (for RHCP and LHCP) and Combiner Subsystem	Coordinate access with NOAA
6	The 13 meter antennas support both L-Band and S-Band commanding using L/S-Band Transmitter (for RHCP or LHCP) Subsystem The 13 meter system uses an exciter that modulates the uplink RF carrier with the selected command source. The resulting RF signal is then sent to the antenna via a fiber optic link. The output of the fiber link is sent to a high power amplifier (300 Watt maximum) which is then coupled to the L and S-Band feed for transmission to the spacecraft. The 14.2-meter Command Transmit Equipment (CTE) provide back-up S-band commanding. The 2 kbps data is BPSK NRZ or Bi-phase modulated onto a 66 MHz carrier, directly or via a 16 kHz subcarrier. The Up Converter within the CTE changes the uplink frequency from 66 MHz to 2.026 GHz and forwards this new frequency to the HPA. The HPA increases the RF power and forwards the signal to the antenna for transmission. Data rates up to 10 kbps are available.	Coordinate access with NOAA
6	Low Earth Orbiting Terminal (LEO-T) workstation	Typical

		system, Coordinate access with NOAA
7	Resource scheduler, (Satellite Operations Management System [SOMS]) - The Contractor will be required to modify existing NOAA spacecraft scheduling software SOMS that uses NORAD two-line element vectors to generate a minute by minute subpoint track in addition to contact and tracking information for up to four readout stations and outputs to a Conflict Resolution and Master Scheduler	Coordinate access with NOAA
8	Data Communications Network (DCN) (OPTIONAL). DCN will be provided as GFE if the Government does not exercise the contract option to acquire a new Jason-2 dedicated capability.	Coordinate access with NOAA

1.6 Documents

Table 1-2 lists the Applicable Documents (AD#) that apply to this contract. In the event of a discrepancy between this SOW and the applicable documents, this SOW shall take the precedence.

Table 1-2 Applicable Documents

AD #	Title	Document Number or Link	Issue	Date
AD-1	NOAA Polar Ground Segment Requirements for the Ocean Surface Topography Mission (OSTM)	Doc. No. NO-NRTOPS/OSD-2004-000XR0U0	Rev. 2	Sep19, 2005
AD-2	NOAA/NESDIS Document Control Procedure	NOAA/OSD3-1999-0035R0UD	DCN0	11/99
AD-3	General Requirements For Ground Requirements For Ground Electronic Equipment	NESDIS NO. S24.802	Revised	04/97
AD-4	Cable and Wire Identification	NESDIS NO. S24.803	Revised	03/97
AD-5	General Requirements for Training on Electronics Equipment	NESDIS NO. S24.804	Revised	06/99
AD-6	NOAA/NESDIS Man-Machine Interface (MMI) Standards	NESDIS NO. S24.807	Revised	08/88
AD-7	Software Development, Maintenance, and User Documentation	NESDIS NO. S24.806	Revised	04/94

AD-8	NOAA/NESDIS Ground Systems Configuration Management Plan for Satellite Operations	NOAA/OSD3-1997-012R1UD0	Rev 1.	02/98
AD-9	NIST Special Publication (SP) 800-18 Guide for Developing Security Plans for Information Technology Systems	http://csrc.nist.gov/publications/nistpubs/800-18/Planguide.PDF	Final	05/04
AD-10	NIST 800-37 Guide for the Certification and Accreditation of Federal Information Systems	http://csrc.nist.gov/publications/nistpubs/index.html	Final	05/04
AD-11	NIST 800-60 Guide for Mapping Types of Information and Information Systems to Security Categories.	http://csrc.nist.gov/publications/nistpubs/index.html	Final	06/04
AD-12	U.S. Department of Commerce, IT Security Program Policy And Minimum Implementation Standards	Revised	Final	06/ 30, 2005
AD-13	NOAA NESDIS Office of Satellite Operations, IT Management User Guide	From OSO IT Administrator	DRAFT	07/ 26, 2005
AD-14	Deleted.			
AD-15	Deleted			
AD-16	FIPS 199	http://csrc.nist.gov/publications/nistpubs/index.html		
AD-17	NIST SP 800-53 Recommended Security Controls for Federal Information Systems,	http://csrc.nist.gov/publications/nistpubs/index.html	Final	02/05
AD-18	NIST SP 800-26 Revised NIST SP 800-26 System Questionnaire with NIST SP 800-53 References and Associated Security Control Mappings	http://csrc.nist.gov/publications/nistpubs/index.html	Final	04/05
AD-19	NIST SP 800-34 Contingency Planning Guide for Information Technology Systems	http://csrc.nist.gov/publications/nistpubs/index.html	Final	06/02
AD-20	OMB Circular A-130	http://csrc.nist.gov/publications/nistpubs/index.html		
AD-21	Federal Information System Management Act (FISMA)	http://csrc.nist.gov/publications/nistpubs/index.html	Final	2002
AD-22	JASON Ground System Interfaces	TP-2-JS-IF-600-CNES	Issue 5, Revision 1	09/17/ 2005

Table 1-3 presents a list of Reference Documents (RD-#) that provide additional useful information for successful program implementation.

(Document reference numbers are based on the NOAA OSTM Ground Segment Documentation Reference List, maintained by OSD)

Table 1-3 Reference Documents

RD #	Title	Document Number	Issue	Date
RD-1	Deleted			
RD-2	Deleted			
RD-3	Reserved	Diagram/Drawing	12	June 2002
RD-4	Deleted			
RD-5	OSTM/Jason2 4 partners Mission Assurance Specs.	TP3-J0-AQ-139-CNES	Issue 0 rev 0	04/25/05
RD-6	NOAA Baseline Polar-orbiting Operational Environmental Satellite (POES) Command and Data Acquisition (CDA) and Satellite Operations Control Center (SOCC) Equipment Configuration	NO-IJ/SO-99-0008R0U0	#2	11/99

1.7 Document Contents

Document sections are as follows:

Section 2 presents the contractor performance requirements for the OSTM/Jason-2 contract
Section 3 system security requirements and issues
Section 4 lists the project reviews
Section 5 details the project deliverables
Section 6 presents the period of performance and schedule

2 CONTRACTOR PERFORMANCE REQUIREMENTS

The Contractor shall provide services and resources for all effort required and as described in this document. The Contractor shall establish and maintain management controls over the OSTM/Jason-2 tasks to support monitoring the Contractor's performance and progress, through standard contract oversight functions performed by the Government.

The Contractor shall perform analyses and complete requirements allocations processes for all requirements in the NPGS Requirements for OSTM document (AD-1). The Contractor shall provide the facilities, materials, and services necessary for the following:

- Designing, developing, integrating, securing, testing, implementing, and operating components and systems in parallel
- Training operations and maintenance personnel
- Providing documentation for the upgraded NPGS and elements as appropriate.

The Contractor shall prepare NPGS internal and external entity Interface Control Documents (ICDs) based on corresponding Government supplied interface requirements documents (IRDs) and shall obtain Government approval for the ICDs prior to any development or incorporation of new functionality into the NPGS elements. The Contractor shall integrate, test, and verify the end-to-end (ETE) functions and performance of the upgraded NPGS and validate to the Government that the NPGS is ready to support the Jason-2 Ground Segment and the OSTM services.

The work described in this section falls into two categories: Baseline Work and Optional Work. The Contractor shall assume total responsibility for Baseline Work in accordance with the contract schedule and agreement. The Contractor shall assume responsibility for Optional Work as authorized by the Government.

The Contractor shall possess (or provide a plan to acquire) the following knowledge and/or expertise:

- Current NOAA Polar CDAS and SOCC facilities and their operations,
- JTCCS as implemented by NASA for current operations,
- Current SOCC satellite scheduling tools
- Commercial off-the-shelf (COTS)-based satellite sequencing and scheduling tools
- Current NOAA ground communications networks
- NOAA/ESPC functionality and processing environment
- CNES-developed Jason product generation software and hardware
- NOAA's long-term Comprehensive Large Array-data Stewardship System (CLASS) data archive facilities and operations
- Federal, Department of Commerce and NOAA Communications Security Policies
- Consultative Committee for Space Data Systems protocol

The effort is dependent upon coordination and cooperation among the OSTM partners, NASA, EUMETSAT, CNES, and their support Contractors. Successful performance requires the Contractor to work within the constraints of the existing NPGS, the Jason-2 Satellite to Ground interface, the OSTM schedule, and the GFE to be integrated into the NPGS. Preferably, the Contractor will be International Organization for Standardizations (ISO) 9000; Quality Management and Quality Assurance certified and/or have Capability Maturity Model Integration (CMMI) Level 2 accreditation.

The Jason-2 project tasks that the selected Contractor shall perform for the Government are categorized in the following functional areas and are described in the ensuing sections:

- Program Management
- System Engineering
- System Design and Upgrades
- System Implementation and Support
- System Verification and Validation
- Operations and Maintenance Support
- DOC/NOAA Security Certification & Accreditation (C&A) Documentation and Application Support

2.1 Project Management

The Contractor shall perform all program management functions including technical and business management functions that are necessary to execute the total effort required by this contract. The Contractor shall provide all personnel and other resources necessary to accomplish these functions, except as otherwise specified in the contract. The Contractor shall perform these management functions through an integrated management approach that includes milestone reviews and deliverables as required in this document.

The Contractor's program management function shall be documented in a Project Management Plan. This plan shall encompass the management efforts addressed in this SOW, reflect responsibility and clearly identify the point of contact for coordinating and managing all identified tasks.

2.1.1 Contract and Cost Management

The Contractor shall provide the contract and cost management efforts necessary to efficiently work with the Government in the design, development, implementation, integration, testing, deployment and training activities required to execute this contract. The Contractor's cost management system shall provide project cost for work performed and status relative to the cost baseline for the contract, as a measure of overall performance of the work completed. The contract and cost management approach shall support earned value analysis and reporting. The Contractor shall include contract and cost management status reports as a part of the Contractor's Monthly Program Status Report. The monthly status report shall also be used to provide projected updates to the Contractor's cost to complete for the contract. The contract cost baseline shall only be updated based on approved changes that have been submitted and approved in accordance with the change provisions within the contract.

NOTE: The Contractor shall keep the costing of the baseline and the optional part (if performed), as mentioned in this SOW, separately.

2.1.2 Technical Progress Reporting

The Contractor shall submit a written Monthly Project Status Report to the NOAA OSTM/Jason-2 Project Manager. The following items shall be included in each status report unless other agreements are made between the Contractor and NOAA:

- Summary (accomplishments, overall status of all tasks)
- Financial (include manpower utilization, work status, cost to complete, and parameters from OMB 300 standard for reporting "Earned Value")
- Schedule of work completed (updated monthly)
- Planned activities (Current and planned reporting periods)
- In-plant (if applicable) and on-site schedule for work to completion
- Documentation status
- Issues and concerns (include risk and mitigation strategies)
- Proposed changes and supporting Information
- System Security (accomplishments, certification and accreditation activities, other support activities)

2.1.3 Scheduling and Coordination

The Contractor shall establish, maintain, and control a detailed schedule that shows the order in which work will take place, including identification of major events and milestones and shall cover the period of performance (POP). The schedule shall also reflect the Contractor's efforts to maintain coordination with the milestones established for the OSTM Project Schedule. The schedule shall include, but not be limited to, the following technical activities as applicable:

- Engineering activities including design reviews and technical interchange meetings (TIMs)
- Software development
- External dependencies
- Contractor site demonstration dates
- Government site availability and installation dates
- In-plant and On-site hardware and software integration & test dates
- NPGS level ("integrated" system) testing dates
- Risk Assessment participation and participation in other security related meetings
- C&A test plans and testing (Security qualification)
- Training NOAA personnel
- Documentation delivery dates

As part of the Monthly Progress Report, the Contractor shall provide to NOAA an assessment report, a mitigation plan, and the schedule and cost impact of any proposed changes to contract

deliverables and scheduled milestones. All changes will be processed for approval within the change provisions of the contract.

2.1.4 Documentation Management

The Contractor shall prepare and maintain a Documentation Management Plan (DMP) section in the Project Management Plan. The Contractor's DMP shall address how the contract deliverables (listed in Table 5-1) are prepared, reviewed for technical content and quality control, and delivered in accordance with approved delivery dates. Coordination of documentation outlines and preliminary drafts with the Governments technical points of contact is necessary. However, if in the Contractor's view, comments received that appear to change the scope or level of the Contractor's efforts, they must be brought to the OSTM/Jason-2 Project Manager's attention and addressed within the change provisions of the contract. The Contractor's DMP shall also reflect how it interfaces with and supports the NOAA/NESDIS Document Control Procedures as applicable (AD-2).

As part of the Contractor's documentation management efforts, the Contractor shall implement a project information centralized web page, with download capability by authorized personnel, within 30 days after the contract award. The web page shall be maintained throughout the POP. The Contractor shall make available on the web page all preliminary review and final delivery documentation, such as drawings, technical manuals, training materials, meeting minutes, correspondence, schedules, design review presentation materials, and other deliverables as noted in Table 5-1. The web page will be password protected and accessed only by NOAA authorized personnel.

2.1.5 Configuration Management (CM)

The Contractor shall prepare and maintain a Configuration Management Plan (CMP) section in the Project Management Plan. The CMP section shall address the Contractor's plans for implementing configuration identification, configuration control, and configuration auditing for contract deliverables including the following:

- System requirements
- System design
- COTS hardware, firmware, and software
- Custom developed hardware and software
- Firmware present in the architecture
- Documentation of the system
- Facility modifications
- Test plans and procedures
- CM for the System Security Plan (SSP) and all other Contractor produced Certification and Accreditation (C&A) documents
- Security Risk Assessment
- Any special test tools

The CMP shall follow the standards specified in the NOAA/NESDIS Ground Systems Configuration Management Plan for Satellite Operations (AD-8) as applicable. The Contractor shall coordinate with the NOAA Contracting Officer's Technical Representative (COTR) for delivery of the Contract Deliverable Requirements List (CDRL) items, shown in Table 5-1.

2.1.6 **Quality Assurance**

The Contractor shall establish and conduct a Quality Assurance (QA) program. The Contractor shall provide a Quality Assurance Plan (QAP) section in the Project Management Plan. The plan shall be implemented at contract award and continue throughout the POP. The plan shall define quality assurance activities including of sequential inspections and progressive Quality Control throughout the development cycle. The QAP shall detail methods for documenting defects, providing for timely correction of deficiencies, identifying deficient areas, and recommending solutions to systemic problems. The plan shall ensure that the quality of all items presented to the Government meets the requirements of the specifications, whether manufactured or processed by the Contractor, or procured from subcontractors or vendors. The status of the QA activities shall be provided in the Monthly Program Status Report.

Contractor performed audits and inspections are independent of those performed by the Government as mutually agreed. The Contractor shall perform its audits and inspections prior to requesting acceptance of the work by the Government.

2.1.7 **Risk Management**

The Contractor shall implement a risk management process that provides a mitigation plan for critical path items in a timely fashion. The Contractor shall provide a Risk Management section in the Project Management Plan to discuss risk management methodologies to be used by the Contractor to ensure that the NOAA OSTM commitments are satisfied and available in accordance with approved schedules.

The Contractor shall provide a subject matter expert (SME) in the area of system operations to support the Risk Assessment (RA) process and the Security Working Group (SWG). The Contractor shall expect the SME or SMEs to participate in two formal RAs, plan for forty (40) hours of support for each RA, and SWG meetings as required.

The Monthly Project Status Reports shall reflect the latest risks, mitigation strategies and recommended solutions.

2.2 System Engineering

The Contractor shall engineer this project, so as to maximize the utilization of existing NPGS capabilities as appropriate. The Contractor shall evaluate using the following (but not limited to) for application to this project, and make recommendations to NOAA of any cost effective alternatives in a timely manner:

- Existing NPGS components at NOAA sites
- Existing communications network for data transfer within NOAA elements/sites
- Existing communications network for data transfer with NOAA external interfaces

- Securing Jason-2 data, data transmissions, and system components

The Contractor shall develop all necessary system capabilities in accordance with one or more functional and performance requirements documents, addressing upgrades to the CDAS, SOCC, ESPC, NOAA data archive facilities and functions, and NOAA data communications network for Jason-2. However, under no circumstances, shall the NPGS upgrades affect the functions or performance of the existing operational POES Ground Segment.

The Contractor shall perform system engineering assessment to accommodate JSDS and its interfaces within the ESPC.

The Contractor shall evaluate using the existing data/product transfer interface between the ESPC and CLASS, and determine if a new interface is required.

Overall, the Contractor shall provide all engineering resources and services required to conduct system engineering analyses and define and develop new functionality as required for integration of the NPGS elements. The Contractor shall define, describe and document, all upgrade functionalities, internal and external interfaces and requirements. The Contractor shall develop and/or procure and install, as required by contract schedule, new functionalities into the CDASs, SOCC, and ESPC to support the Jason-2 project services.

2.2.1 **Requirements Analysis**

The Contractor shall conduct a formal requirements analysis. The Contractor shall allocate NPGS requirements to functions, designs, and components, identifying and documenting subordinate requirements as needed. The Contractor shall maintain requirements traceability and requirements to verification traceability, and shall track changes to the requirements. Any Contractor initiated changes to the baseline requirements shall be submitted to NOAA for review and approval.

The Contractor shall identify and document all system interfaces among the NPGS elements (internal to NOAA) and NPGS interfaces with external agencies. The contractor shall review the government supplied IRDs and develop corresponding ICDs. These ICDs shall define/identify the functional and physical design of each interface including precise data content, format and method of exchange for each data flow. The ICDs shall be provided for Government approval. Copies of the ICDs shall be provided per the CDRL.

2.2.2 **Requirements Management Tool**

The Contractor shall use a requirement management tool for requirement tracking and traceability. The Contractor shall also develop and track a requirement-to-test traceability matrix using the tool.

2.2.3 Requirements Allocation to System Design

The NPGS upgrade design shall follow the general requirements identified in the NOAA/NESDIS General Requirements for Ground Requirements for Ground Electronic Equipment (AD-3) as applicable. The Contractor shall present to NOAA the allocation of requirements to functions and key system design features at a formal SRR.

2.3 System Design and Upgrades

The overall Contractor effort with respect to system design and upgrades and subsequent implementation and deployment, entails upgrading/modifying four primary functional "Elements" of the existing NPGS.

- Telemetry, Command and Control (C2)
- Data Processing and Distribution
- Archive and Access
- Data Communications Network (DCN)

By definition, the elements are sufficiently independent of each other that work in each can be performed as parallel tasks. However attention must paid to synchronize interdependency testing during integration and testing phase of the work.

General Requirements

- The upgrades shall support continuous 24-hours-a-day, seven-days-a-week operations.
- The design shall not require the Government to increase, in any significant manner, either the operational personnel or the operator's workload.
- The Contractor shall maximize the use of existing NPGS operational systems and functions.

2.3.1 Telemetry, Command & Control (C2) Element Upgrades

This Element is further broken down in to the SOCC and CDAS upgrades.

2.3.1.1 SOCC and CDAS Upgrades

Within NESDIS, the SOCC and the CDASs are organizationally administered by the OSO. The Contractor shall develop all necessary SOCC and CDAS system capabilities in accordance with one or more functional / performance requirements documents addressing those upgrades. The Contractor shall coordinate with the Jason-2 project manager for activities at the SOCC and CDASs.

Primary SOCC and CDAS upgrades include the following:

- Integration of the NOAA provided JTCCS software (GFE) developed for Jason-1 satellite telemetry, command and control operations. NOAA's in house test of the software has shown that the software is mostly compatible for use at the NOAA CDASs. Some enhancements may be required to integrate it in the CDAS and SOCC environments and be compatible with Jason-2. A JTCCS "development environment" (GFE) will be made available to the Contractor for modifying the JTCCS.

- Development of a software tool for the coordination, integration and generation of Jason-2 weekly stored command files (sequences) known as the Jason-2 Sequencer (J2SEQ). This tool will sort the on-board command file and put the commands in sequence, and check for no conflicts, constraints and time order. The sequencing tool shall be compatible with JTCCS and the existing POES scheduling tool, Satellite Operations Management Subsystem (SOMS), at SOCC.
- Compatibility of both WCDAS and FCDAS with Jason-2 satellite-to-ground interface and system requirements.
- Capability for SOCC to process spacecraft telemetry, monitor health and safety, process command files from CNES and generate satellite commands.
- Capability for SOCC to remotely control the ET and send commands to the satellite via the Earth Terminal at Usingen.

2.3.2 **ESPC Upgrade (OPTIONAL)**

Within NESDIS, the ESPC is organizationally administered by the Office of Satellite Data Processing & Distribution (OSDPD).

The primary upgrade effort includes the integration of the JSDS (GFE) system within the ESPC. The JSDS provides the raw data processing capability to produce near-real-time (NRT) data products such as the Operational Geophysical Data Records (OGDR). It is provided as a turnkey system by CNES.

As required by contract schedule, using JSDS the Contractor shall develop all necessary ESPC system capabilities, in accordance with functional and performance requirements as stated in the NPGS Requirements document (AD-1), to generate and transmit the OGDRs from ESPC to EUMETSAT and CNES, as well as to the selected archive database including the NOAA CLASS.

The Contractor shall perform system integration and testing of the JSDS system within the operational environment of the ESPC. There is a stringent timeliness/performance requirement for the OGDRs of availability within 3 hours of observation. This 3 hours requirement includes latency onboard the satellite and all communications and data processing times.

2.3.3 **Archive and Access System (AAS) Interface Upgrade**

Within the NOAA/NESDIS, the Access and Archive functions are organizationally administered by the CLASS system.

The capability to archive Jason-2 data will be provided by the NOAA CLASS system, and the upgrades within CLASS to support Jason-2 data archiving requirements will be performed by CLASS, hence are <u>not</u> in the scope of this SOW. However a Jason-2 data and product transfer interface from ESPC to CLASS is required. The Contractor shall investigate the feasibility of using an existing data/product transfer communication interface between the ESPC and CLASS for this purpose. If a new link is needed, the NPGS Contractor is responsible for designing,

developing, implementing and testing the data interface from ESPC to CLASS for OSTM data transfer with Government approval.

As required by contract schedule, the Contractor shall develop all necessary AAS system interface capabilities in accordance with functional and performance requirements stated in AD-1 and other applicable documents.

2.3.4 **NPGS Data Communications Network (DCN) Upgrade (OPTIONAL)**

The scope of the NPGS DCN includes communications and networking services.

The NPGS DCN shall include access and communications services to exchange OSTM data among NOAA elements, as well as communications from NOAA to EUMETSAT and CNES as identified in Table 2-1. The contractor shall propose and itemize the cost of each external (to NOAA/Suitland) link identified in table 2-1. The Contractor shall provide a turnkey, fully integrated system communications network solution with throughput for the communication links to support the exchange of data to meet timeliness and performance requirements as indicated in AD-1 (Sections 3.1.10, 3.1.11, and 3.1.14). Section 8 of AD-22 provides OSTM data volume, duration, and rates for each stream in Table 2-1.

The communication between NOAA SOCC/Suitalnd and CNES is performed through an EUMETSAT interface, that is, NOAA has a direct physical link from NOAA/Suitland up to EUMETSAT only, and EUMETSAT has a separate link to CNES. There is no direct physical link between NOAA/Suitland and CNES. The WCDAS, as a SOCC back up, shall have a separate direct link to EUMETSAT and FCDAS for command and spacecraft health and safety data exchange.

The Contractor effort is dependent upon coordination and cooperation among the Contractor and NOAA staff/contractors for work that requires interface to existing networking and communications infrastructure. The Contractor shall procure, install, integrate and system test all required communications equipment with the equipment in SOCC, WCDAS, FCDAS and EUMETSAT, Darmstadt (Germany). The Contractor shall be responsible for all equipment operation and maintenance as needed. The Contractor shall also be responsible for negotiating with local access carriers and communications equipment vendors, and providing any required support staff in the US and Europe. The Contractor shall assume complete responsibility for all proposed equipment in Europe.

Networking services shall include Local Area Network (LAN) and IP routing hardware that will ensure the delivery and distribution of Jason-2 data streams to the respective NPGS elements in Suitland and EUMETSAT in Darmstadt (Germany) as indicated in Table 2-1. The Networking services shall also include all the security infrastructure and services to meet security requirements as indicated in section 3 of this SOW. The Contractor shall include all required equipment and the installation, operations, and maintenance associated with that equipment for the contract period of performance.

Table 2-1 OSTM/Jason-2 DCN Data Stream Distribution

Link #	FROM	TO	Data Types	Comment
1	FCDAS (1300 Eisesle Rd. Fairbanks, AK.	SOCC	HKTM-P, HKTM-R, Payload science data	
2	SOCC (4401 Suitland Rd. Md. 20747)	FCDAS	TC	
3	WCDAS (35663 Chincoteague Rd. Wallops, VA.	SOCC	HKTM-P, HKTM-R, Payload science data	
4	SOCC	WCDAS	TC	
5	SOCC	ESPC/Suitland	Payload science data, NRT products	NRT products from EUMETSAT
6	ESPC/SOCC	EUMETSAT	NRT products, TC	TC to Usingen via EUMETSAT
7	EUMETSAT (Am Kavalleriesand 31, Postfach D-64295, Darmstadt, Germany)	SOCC/ESPC	HKTM-P, HKTM-R, NRT products	Data from Usingen via EUMETSAT
8	SOCC/ESPC	CNES	HKTM-P, HKTM-R, NRT products	Via EUMETSAT to CNES
9	CNES (18 Avenue Eduard Beline, 31401 Toulouse, France)	SOCC	TC files, GDRs and SGDRs (Offline products)	Via EUMETSAT to NOAA
	EUMETSAT	WCDAS	TC data	TC data from CNES via EUMETSAT to WCDAS
10	WCDAS	EUMETSAT/CNES	TM data	TM data via EUMETSAT to CNES
11	WCDAS	FCDAS	TC data	TC data
12	FCDAS	WCDAS	TM data	Spacecraft health & safety monitoring

The Contractor shall propose a design for the telecommunications services and networking infrastructure to design the NPGS DCN as a dedicated standalone network. The proposal shall include a detailed DCN architecture. The Government will have the option to fund the proposed DCN architecture design or using its own services and facilities.

The NPGS DCN shall provide commercial-grade data communications capabilities within the network using industry standard network components and protocols. The NPGS DCN Network shall be designed to allow for growth with a flexible and extensible architecture. The architecture proposed shall utilize modular and scalable technology to ensure NOAA's investment is protected against obsolescence and can readily make use of new telecommunications services.

The NPGS DCN shall be operated on a 24/7 basis for 365 days a year by the Contractor and shall support mission critical functions and provide appropriate reliability and availability including network transport and access diversity, and rapid response time for Contractor Network outages. The NPGS DCN shall provide availability performance of all communications circuits and support complete data transfer functions including schemes such as automatic restoration and reconfiguration and automatic re-routing on the Contractor's network. The Contractor's normal maintenance/upgrades shall not degrade the performance of the network.

Ethernet 10/100 BT shall be the NOAA local interface at the respective facilities. The Contractor shall coordinate all IP address management activities with existing NOAA IP addressing schemes and any proposed infrastructure shall be flexible to adapt to NOAA's IP addressing requirements. In addition, the Contractor shall support NOAA network security requirements for isolation of the OSTM networking hardware from SOCC as indicated in Section 3 and Appendix B.

2.4 System Implementation and Support

The Contractor shall implement and test all necessary system capabilities in accordance with one or more functional and performance requirements and design documents for the NPGS. The Contractor needs to become cognizant of the requirements, process and procedures of individual NPGS facilities/elements for hardware/software system implementation within their facilities.

The Contractor shall implement all functional and performance requirements as detailed in the NPGS Ground Segment Requirements for OSTM Document (AD-1) down to the NPGS elements. The system implementation shall meet all NPGS requirements, including security requirements, and provide the capability to support operations in accordance with the security requirements of each OSTM partner.

2.4.1 Implementation Plan

The Contractor shall develop and submit an implementation plan for Government approval. The plan will describe the process, sequence and schedule for all system implementation and facility changes/upgrades.

2.4.2 **Facility Changes**

The Contractor shall, as applicable and appropriate, locate the SOCC and ESPC and its interface with CLASS, respective hardware and software source code and executable at Suitland, Maryland in a NOAA designated area. The Contractor shall locate CDAS hardware and software at Wallops, Virginia and Fairbanks, Alaska. The Contractor shall determine all facility changes needed for the upgrades and shall submit to NOAA all facility requirements for approval, including floor space, air conditioning, electrical power, and safety during system development. These facility requirements shall be presented at the PDR and finalized at the CDR. Contractor may perform a site survey prior to the PDR if necessary.

2.4.3 **Documentation**

The Contractor shall document the upgrades by providing appropriate documentation for the following:

- On-line Help
- Software Users Manuals
- Software Build/Delivery Procedures
- Database Generation/Delivery procedures
- Software Maintenance Manuals
- System C&A Test Plans, System Security Plan, and other security artifacts/documents as directed

The Contractor shall update all hardware system documentation, including rack level drawings and cable interconnection drawing and shall update the CDRL as appropriate. The Contractor shall deliver, maintain and provide a list of hardware, hardware manuals, operating system manuals, and COTS software manuals delivered to NOAA.

2.4.4 **Hardware Support and Procurement**

The Contractor shall provide hardware engineering support to establish the baseline hardware configuration, to obtain all required NPGS Upgrade equipment, and to install, test, and maintain the equipment. The Contactor shall provide justification for all equipment procured. The justification shall allocate requirements to the equipment procured. The Contractor shall perform a trade study that supports the COTS hardware selections. The Contractor shall present the selection justification at the PDR and/or CDR and provide a COTS Selection and Evaluation Report. The Contractor shall obtain Government approval of the COTS selection prior to any procurement of hardware. Once received from the vendor, the equipment shall be integrated and tested by the Contractor.

The Contractor shall use quality control procedures and personnel to ensure that the delivered equipment is fabricated in accordance with best commercial practices and has successfully passed all in-house testing. NOAA reserves the right to request copies of quality control fabrication and test reports. All installed cabling and wiring shall comply with the NOAA/NESDIS Cable and Wire Identification Standard (AD-4).

The equipment shall be designed for continuous operation (24x7) with minimal maintenance requirements. Satisfaction of the reliability, maintainability, and availability requirements shall be a prime consideration in the selection, purchase, or design of equipment.

All potential hazards to operating and maintenance personnel are to be minimized or eliminated by the unit's design. All installation work shall be performed in accordance with applicable codes and ordinances, and shall be done in a manner that does not interfere with other operational systems that may be collocated at the site. The Contractor shall provide all items necessary to ensure proper operation of all equipment provided.

The provided equipment shall cause no electromagnetic (emitted or conducted) interference-related negative effects on nearby information technology, RF emitters, telecommunications, or other electronic equipment located at the SOCC, ESPC or CDASs. Reasonable effort shall be made to limit voltages and currents occurring during fault conditions. Voltages shall be kept below the dielectric breakdown strength and current shall be kept below the maximum capabilities of the system and its components.

2.4.5 **Software Implementation**

All new and updated software shall be developed in accordance with the Software Development section of the NOAA/NESDIS Software Development, Maintenance, and User Documentation (AD-7). This effort will maximize the re-use of existing code and preserve functionality and file format to minimize operational impact. All new software modules will contain a standard prolog. Modified modules shall include programmer name, date, and reason for change. This applies to all software that is adapted from the existing system, and to Contractor-developed software.

The NOAA Polar Acquisition & Control System (PACS) Development Rail will be available for developing and testing software changes. NPGS Upgrades shall not impact current operations. The Contractor shall follow the PACS Configuration Management software procedures and security issues for all software upgrades.

2.5 System Verification and Validation (V&V)

The NPGS Upgrade Contractor shall define an approach and methodology for the Jason-2 system verification and validation. The Contractor shall develop all Verification and Validation (V&V) documentation as required in this SOW and the system requirements documents. These documents shall be distributed to the government for approval. The verification plan shall include a NPGS requirements verification (test case) matrix, relating requirements to test cases where they are verified.

The Contractor shall conduct first article testing and preliminary interface testing with simulated data or satellite simulator to minimize the risks. The Contractor shall plan and conduct testing at the Contractor's location and at the Government's operational locations to verify that the NPGS upgrades can support the OSTM/Jason-2 services.

2.5.1 Test Planning Documentation

The Contractor shall prepare and present a Master Verification Plan describing the overall verification and validation methodology. Contractor shall provide additional documents such as the Test plans, Test Procedures, Security Test Plan (focusing upon the approved Technical Controls based upon the appropriate NIST 800-53 system impact designation and any additional identified technical security controls), Test Reports and Traceability Matrices in a timely manner. An annotated outline for all these documents shall be presented at the SRR for Government approval.

2.5.2 Test Data & Tools

At the PDR, the Contractor shall provide description of test data sets to be used or required as GFE, and test tool to be used or developed. A Jason-2 spacecraft simulator (Presto) at CNES will be made available to test the NPGS-to-spacecraft interface compatibility, the access and timing for its use will have to be coordinated through NOAA.

2.5.3 Development Test

Developmental testing shall be performed by the Contractor, mostly at their facilities, for major functional components and subsystems prior to their installation on-site. The Contractor shall ensure that software unit testing addresses unit-level sizing, timing, and accuracy requirements. Unit testing may demonstrate conformity to specific requirements at the unit level. Tests plans and procedures will describe how, when, and from where the test-unique support items will be obtained: NOAA should be notified if GFE is needed. The Contractor shall provide test schedules consistent with higher-level plans. NOAA should be advised of the developmental test schedule for witnessing the testing of security functions.

2.5.4 On-site Integration Test

The Contractor shall perform on-site integration tests at each site. Integration testing shall take place at WCDAS, FCDAS and SOCC separately and jointly. These tests shall ensure that each site is fully functional and meets the performance prior to the “integrated NPGS” level testing. Tests could include, as appropriate—parallel tests, stress tests, and regression tests to assess candidate systems for their operational robustness and performance.

The test plans shall include the definition of the type of testing required for each level of hardware and software (above the unit-level) and presentation of general and specific requirements that will be verified. Test procedures shall be validated during this test, including software build and delivery, and any associated database checkout.

Government shall have the option of witnessing these tests and reviewing the informal (non-deliverable) test procedures.

2.5.5 System Acceptance and Deployment

The Contractor shall develop the Acceptance Test Plan and Procedures, and conduct detailed Acceptance Testing to demonstrate functionality and interface performances. There shall be

separate acceptance testing for CDAS upgrades, SOCC upgrades, ESPC Upgrades, DCN, external interfaces and the "integrated NPGS Upgrade" end-to-end validation.

All test cases/procedures shall be traced to the requirements that are verified by maintaining a requirement-to-test case verification matrix. In the event of deficiencies, the Contractor shall determine suitable resolutions for approval by NOAA. The Contractor shall provide the necessary changes and repeat the test as necessary to resolve any deficiencies. The Contractor shall provide an Acceptance Test Reports after each major group test. The 'as run' Test Procedures shall be included in the Test Reports. At the conclusion of the test and acceptance of the system via an acceptance test review, NOAA will notify the Contractor in writing that the system has been accepted.

NOTE: If formal security testing is to be witnessed by the government, the preference is to conduct security testing during the individual segment integration phase, to gain assurance and not delay the program's operational date.

2.5.6 **Joint Systems Tests**

The Joint System V&V will be coordinated by NOAA. The Contractor shall support Joint ETE System Testing, performed with the three OSTM partners following the NPGS Integrated V&V, to verify all interfaces and functionality among the partners. The Contractor shall support the Joint ETE System Test activities and support the test documentation effort. The Contractor shall provide support for the duration of the Joint ETE System Testing through the completion of the first Jason 2 satellite handover.

2.6 Maintenance Engineering

2.6.1 **Training**

The Contractor shall develop a comprehensive Training Plan and shall provide training classes to NOAA operational personnel. The content and conduct of all training shall be based upon the NESDIS General Requirements for Training on Electronics Equipment. Training shall be directed toward government and Contractor personnel, who perform spacecraft mission operations and maintenance, scheduling, spacecraft health and safety monitoring, data processing and ground hardware and software maintenance. The training class material shall cover all aspects of the NPGS Upgrade including newly deployed hardware and software and modifications to existing hardware and software, with special emphasis on new and modified interfaces.

Training shall be provided as a mix of classroom presentation and hands-on activities.
All training must take into consideration all shifts and shall be held at NOAA facilities. This will require coordination on the part of the Contractor with NOAA.

2.6.2 **Hardware Maintenance**

The Contractor shall perform maintenance of the newly installed hardware, including repair, on all equipment procured by this contract through the POP of this contract. NOAA will provide

GFE in working condition and shall provide maintenance support for GFE that already exists on the current NOAA maintenance contract. Any hardware maintenance support of equipment purchased by the Contractor for these upgrades shall be transitioned to NOAA and/or a NOAA designated Contractor. The Contractor shall provide a recommended list of spares and procure spare equipment approved by the Government.

The Contractor shall provide initial security hardening of hardware components. The Contractor shall provide their best practices for initially hardening hardware components, such as changing the vendor provided passwords and disabling ports or services that could be exploited.

2.6.3 **Software Maintenance**

The Contractor shall retain full responsibility for the newly installed software maintenance following Final Acceptance Test through the POP of this contract. The software maintenance effort includes corrective changes to the software configuration. Documentation updates shall be made as necessary, to reflect all changes in Software Users Manual and Software Maintenance Manuals. These updates shall be made in accordance with the Software Maintenance and User Documentation sections of the NOAA/NESDIS Software Development, Maintenance, and User Documentation.

3 SYSTEM SECURITY

System security is of utmost concern to NOAA. In addition to the IT requirements stated in the applicable documents (AD-9 through -21) and Attachment-B, the Contractor shall apply and ensure that all implemented systems and contractor efforts are in total compliance with Federal, DOC, NOAA and OSO security requirements, including but not limited to, Information Technology (IT) communication security requirements, for all functions both automated and manual. For reference use the NIST and NOAA IT Security web pages for laws, statutes, and regulations.

The security aspects of the upgrades shall be included in the System Life Cycle Development methodology and are required to protect the systems, network, and data in accordance with the Federal information security laws and regulations that focus on the confidentiality and integrity of data and the availability of the system and its data.

As appropriate, the NPGS upgrade Contractor shall participate in the Jason-2 Security Working Group (SWG). The SWG shall meet to discuss security issues affecting the mission and operation of Jason-2 and connected NOAA/POES systems. Other members of this working group are the COTR, OSD, a security representative from Office of Satellite Operations (OSO), Aerospace and Mitretek Systems (MTS).

The Contractor shall provide support and documents for the Jason-2 Certification and Accreditation (C&A) effort. The Contractor shall provide, as an attachment to their proposal, a preliminary C&A Plan. The C&A Plan shall contain a description and schedule of activities and deliverables to ensure the successful accreditation of the proposed system in the proposed project schedule in accordance with (IAW) Federal, DOC and NOAA IT security guidance.

3.1 Operational LAN Protection

The NPGS Upgrade shall not in any way compromise the security of the CDAS, SOCC or ESPC operational LANs. No direct connection from any external non SOCC entities shall be possible with the operational LAN.

3.2 Monitoring and Control

The NPGS Upgrade Contractor shall only grant logical user access to SOCC and CDA systems when authorized by the COTR in writing. The Government will define the type of user access or account privileges to be granted for each authorized user account.

3.3 User Log

The NPGS Upgrade Contractor shall maintain a log of all (successful and unsuccessful) entry attempts. An entry attempt is any request to access SOCC and CDA resources by anyone.

3.4 Suspicious Network Activity

The NPGS Upgrade Contractor shall detect suspicious network activity and incorporate a reporting mechanism to alert the network manager. Example of suspicious network activity includes attempts to gain access to the SOCC, ESPC or CDA system by masquerading as users, applications, network operating system requests, or network devices.

3.5 Firewall

The NPGS Upgrade Contractor shall propose a firewall solution to protect Jason-2 and other connected NOAA systems against unauthorized access. The SOCC Upgrades shall provide e-gap One-way interface technology to protect external interfaces as needed. The proposed Contractor firewall solution shall be IAW the security requirements provided in Appendix B.

3.6 DOC/NOAA Certification & Accreditation (C&A) of the Jason-2 System

The NPGS Upgrade Contractor shall support the Jason-2 system C&A as required (Table 3-1), and provide complete supporting documents and diagrams as required by the DOC/NOAA C&A processes.

Table 3-1 Jason-2 C&A Activities

Lead	**Participants**	**Activity**	**Contractor Deliverable**	**Deliverable Timeframe**
Gov	Gov	Completing the Security Self-Assessment (SSA)	Completed SSA Checklist	No Later Than (NLT) 30 days after contract award
Contractor	Contractor (After award Gov and SWG help)	Drafting the C&A Plan	C&A Plan	Prelim w/ SOW Response Interim @PDR Final @SDR

Lead	Participants	Activity	Contractor Deliverable	Deliverable Timeframe
Contractor	Contractor, Gov, SWG	Developing the Security Requirements Traceability Matrix (SRTM)	SRTM	Prelim 60 days after contract award Final @ SDR
Contractor	Contractor, Gov, SWG	Developing the System Security Plan (SSP)	SSP	Prelim @ PDR Interim 2 weeks after Initial RA Final 2 weeks after Final RA
Contractor	Contractor, Gov, SWG	Developing the Contingency Plan	Contingency Plan	Prelim @ PDR Final @ SDR
Contractor	Contractor, Gov, SWG	Developing the Security Test Plan (STP)	STP	Prelim @ PDR Final 2 weeks after Initial RA
Gov	Contractor, Gov, SWG	Conducting the Initial Risk Assessment (RA) within 30 days of PDR	Risk Assessment Report	Final 2 weeks after RA
Gov	Contractor, Gov, SWG	Conducting Security Testing and Evaluation (ST&E) within 60 days of STP acceptance	Security Test Report	Final 2 weeks after ST&E completed
Gov	Contractor, Gov, SWG	Conducting the Final Risk Assessment (RA) within 30 days of CDR	Risk Assessment Report	Final 2 weeks after RA
Gov	Contractor, Gov, SWG	Conducting Jason-2 Security Working Group (SWG) Meetings (to be held at least monthly)	SWG Meeting Minutes	Final within 48 hours of meeting

3.7 Additional Security Requirements

The Contractor shall provide separate pricing and descriptions for the additional security requirements detailed in Appendix B. The Government will have the option of funding the Contractor's response to Appendix B.

4 PROJECT REVIEWS

The system design shall follow the general requirements identified in the NOAA/NESDIS General Requirements for Ground Electronic Equipment. The Contractor shall demonstrate its understanding of the system requirements at the SRR and shall present design detail at the TIMs, PDR, and CDR.

4.1 System Requirements Review

The Contractor shall prepare and conduct a formal System Requirements Review (SRR) presentation at the NOAA facility in Suitland, Maryland. The purpose of this review shall be to present to the Government the effort done under Section 2, Requirements Definition, including—but not limited to—requirements analysis, allocation, traceability, and verification methodology. The presentation shall also include, as appropriate, interface requirement identifications, trade-off and feasibility studies, and implementation approaches. The Contractor shall demonstrate the requirements and management tracking tools. The Contractor shall prepare and deliver slides and documents, as applicable, clearly showing the requirements traceability to lower levels and to system design (Requirements and Design Document). Other project documentation per the CDRL and status, including preliminary concept of operations, project schedule, shall also be presented.

4.2 Technical Interchange Meeting (TIM)

The Contractor shall provide for periodic TIM detailing the NPGS modifications, progress, issues, analyses, design details, etc. The Contractor or the COTR may schedule a TIM to facilitate development activities and clarify interpretation of issues. The COTR will be responsible for designating the subject, time, and place of such meetings and ensure the availability of appropriate Government personnel.

4.3 Preliminary Design Review (PDR)

The Contractor shall perform a preliminary design effort and present the results at a formal PDR at NOAA facility. The contractor shall show the design of the system, design heritage and mapping of the system requirements and functions to a preliminary System Design, and present all information in a System Description Document (SDD). The COTS trade-studies shall be documented in a COTS Selection and Evaluation Report.

Human computer Interface design shall follow the standards set forth in the NOAA/NESDIS Man-Machine Interface (MMI) Standard. An Analysis shall be performed by the Contractor to determine that the Operator HCI will not impact current operations and will not result in a significant operator workload increase. This will result in an Operator Human Computer Interface (HCI) Analysis report.

The PDR shall at a minimum include the following:

- System overview
- General architecture with proposed hardware and software modules at a high level, to include functional flow, and requirements allocation data for the system.
- Equipment layout drawings and preliminary drawings, including any proprietary or restricted design/process/components and information.
- Description of Development and support tools.
- Safety and security engineering considerations
- Preliminary lists of materials, parts, and software
- Environment control and thermal design aspects
- A detailed schedule

- COTS trade-studies

The following Contract Deliverables shall be delivered at PDR:
- Operator Human Computer Interface (HCI) Analysis
- Configuration Management Plan
- Preliminary System V&V Plan
- COTS Selection and Evaluation Report
- Preliminary System Implementation and Deployment Plan for SOCC and CDASs
- Preliminary Operations and Maintenance Support Plan for SOCC and CDASs
- Preliminary Software Transition Plan
- Preliminary ICDs
- Preliminary C&A documents (as indicated)
- Final PDR Presentations
- Preliminary SDD

All Plans shall include the appropriate drawings. The PDR review process is intended to serve as an interim step in the design process where NOAA and the Contractor agree that the design is proceeding as planned and meets the requirements.

4.4 Critical Design Review (CDR)

The CDR shall represent a complete and comprehensive presentation of the entire design details for the NPGS Upgrade. The Contractor shall describe the functional software modifications with supporting rationale. All details, of which modules will be written, reused, or COTS shall be clearly identified. In the SDD requirements shall be mapped down to the module level. The CDR shall present the refined system hardware architecture in sufficient detail with supporting rationale (including trade-off studies) to allow Government authorization for material procurement. Product and System Safety, Problem Areas, and Security Issues shall all be items discussed at the CDR.

Completion of the CDR and resolution of all of the action items generated by it constitutes the baseline design for the NPGS Upgrade. Drawings shall be released and formal configuration control initiated no later than the date of the CDR.

The CDR shall include the following:
- Final system design details
- New hardware and software module details
- Identification of modified software processes and modules
- Storage control and allocation details
- System performance estimates
- Final and updated equipment layout drawings, including any proprietary or restricted design/process/components and information.
- Description of development and support tools updated from PDR.
- Final safety and security engineering considerations

- Final C&A documents (as indicated)
- Final list of materials, parts, and software
- Final environmental control and thermal design aspects
- Updated milestone schedule

The following Contract Deliverables shall be delivered at the CDR:

- Final System Deployment and Installation Plan
- Final Operations and Maintenance Support Plan
- Final IRDs
- Interim Updates to the ICDs
- Final Software Transition Plan.
- Training Class Plan
- Final SDD
- Draft Software Maintenance Manual
- Final System Verification Test Plan and the approach adopted for "Requirement-to-Test" traceability
- COTS selection and Evaluation results report

Completion of the CDR and resolution of all action items generated by the CDR constitutes the baseline design for the NPGS Upgrade.

5 DELIVERABLES

All hardware shall contain the latest version of firmware within three months of delivery to the Government. QA procedures shall be applied to all custom hardware, firmware, software, and all upgraded custom software. The procedures shall verify that the software has been tested and documented, at a minimum, with inline comments and prolog. All COTS and Operating System software shall be up-to-date within three months of delivery to the government.

Documents shall be delivered per the CDRL and schedule and shall follow the standards specified in the NOAA/NESDIS Document Control Procedure (AD-2). Appropriate bindings shall be selected for each deliverable. Each document shall be clearly labeled on the cover with its title, document number, date, and version. Each document shall include a document change page form and a document revision history. Text to be provided in MS WORD format and drawings in (TBC) format. A request for waiver of electronic delivery will be submitted on a case-by-case basis for documentation not able to be formatted as such. Where appropriate, the Contractor shall provide change pages to existing NOAA documentation.

The specific documents to be delivered to NOAA as part of the performance requirements of the NPGS contract are listed in Table 5-1. The Contractor shall propose annotated outlines and the reference it is based on (eg. IEEE, etc.) for each of the document listed in the CDRL and obtain Government approval prior to writing the document. The table also indicates the quantity of items to be delivered and the scheduled month for delivery. The contractor shall provide a

detailed list of proposed equipment and quantities to the Government, divided into logical/functional groups (e.g., servers, workstations, WAN/LAN equipment, off-line data storage, etc.).

Table 5-1
Contract Deliverable Requirements List

CDRL #	Document Title	Copies			Deliverable date
		Hard Copies	Electronic	Web-Page	
CDRL 1	Minutes and Action Items from Technical and Design Review meetings	0	Email	Yes	As required
CDRL 2	Monthly Project Status Reports	0	Email	Yes	Monthly
CDRL 3	Project Management Plan	1	3 CD	Yes	30 days after contract award
CDRL 4	System Implementation & Deployment Plan	1	3 CD	Yes	Prelim. @PDR Final @CDR
CDRL 5	Software Transition Plan	1	3 CD	Yes	As required
CDRL 6	SRR Presentation Package	1	3 CD	Yes	7 Working Days prior to presentation
CDRL 7	Annotated outline for ALL CDRL Documents	1	3 CD	Yes	SRR
CDRL 8	PDR Presentation Package	1	3 CD	Yes	10 Working Days prior to presentation
CDRL 9	Software Build/Delivery schedule	1	1 CD	Yes	PDR
CDRL 10	Database Generation/Delivery Procedures & Schedule	1	1CD	Yes	PDR
CDRL 11	Operator Human Computer Interface (HCI) Analysis	1	3 CD	Yes	PDR
CDRL 12	Risk analysis, mitigation and management Plan	1	3 CDs	Yes	Preliminary @PDR Final @CDR
CDRL 13	System Operations Concept	1	3 CDs	Yes	Preliminary @PDR Final @CDR
CDRL 14	System Security	1	3 CD	No	Prelim @ PDR Interim 2 weeks after Initial RA Final 2 weeks after Final RA
CDRL 15	Security Test Plan	1	3 CD	No	Prelim @ PDR Final 2 weeks after Initial RA
CDRL 16	Contingency Plan	1	3 CD	No	Prelim @ PDR Final @ CDR

CDRL #	Document Title	Copies			Deliverable date
		Hard Copies	Electronic	Web-Page	
CDRL 17	Certification & Accreditation Plan	1	3 CD	No	Prelim w/ SOW Response Interim @PDR Final @CDR
CDRL 18	Security Requirements Traceability Matrix	1	3 CD	No	Prelim 60 days after contract award Final @ CDR
CDRL 19	CDR Package	1	3CD	Yes	10 working days before presentation
CDRL 20	COTS Selection and Evaluation Report	1	3CD	Yes	CDR
CDRL 21	Operations and Maintenance Support Plan	1	3 CD	Yes	CDR
CDRL 22	Training Class Plan	1	3 CD	Yes	CDR
CDRL 23	Internal ICD	1	3 CDs	yes	Draft @ CDR Final @FAT+30 days
CDRL 24	External ICDs	1	3 CDs	yes	Draft @ CDR Final @FAT+30 days
CDRL 25	System Description Document (SDD)	1	3 CDs	yes	Prelim. @PDR Final @CDR
CDRL 26	Acceptance Test Plan	1	3 CDs	Yes	Prelim. @CDR Final 2 months prior to test date
CDRL 27	Acceptance Test Procedures	1	3CD	Yes	10 working days prior to test
CDRL 28	Acceptance Test Report	1	3 CDS	Yes	30 days after test
CDRL 29	Training Class Material	1	3 CDS	Yes	10 working days prior to training
CDRL 30	Software Maintenance Manuals	1	3 CDS	Yes	45 days after acceptance test
CDRL 31	Software Users Manual	1	3 CDS	Yes	45 days after acceptance test

6 PERIOD OF PERFORMANCE AND SCHEDULE

6.1 Period of Performance

The Contractor POP is divided into two phases as follows:
Phase 1:

Primary POP: Begins with the contract award date and ends with "NPGS Upgrade Acceptance" by the Government. At the discretion of the Government, the System Acceptance date will be scheduled after the completion of all contracted work including successful completion of the NPGS integrated system end-to-end acceptance testing and reporting, all training and documentation delivery to the Government.

Phase 2:
Maintenance Phase: This period of contractor support begins with the NPGS Upgrade Acceptance and ends with Jason-2 Launch plus one (1) year to the date. During this period the Contractor support shall mainly consists of system maintenance and trouble-shooting as necessary. The Contractor may be called upon to assist with minor system upgrades as necessary. The launch is presently scheduled for June 2008.

Accordingly the Contractor shall cost the two phases separately in the cost proposal.

6.2 Place of Performance

The Contractor will perform tasks at their facility, however the final implementation and verifications for all systems shall be performed on site, at Government facilities as applicable, where the systems are deployed and operated.

6.3 Travel

The Contractor should include some overseas travel as part of this contract for technical interchange meetings and joint system reviews.

6.4 Performance Schedule

[* Indicates Four-Partner interface activity with tentative date for reference.]

No.	Item	Schedule (Tentative)	Comment
1	System Requirements Review Completion	30-45 days after contract award	Contractor selects a date in between.
2	PDR Completion	45-60 days after SRR (End June 06)	Contractor selects a date in between.
3	* DCN Functional interface test with EUMETSAT	June-Aug 06	Initial COMM I/F Check.
4	CDR Completion	45-60 days after PDR (End Aug 06)	Contractor selects a date in between.
5	Data Communications Network Implementation & Interface Tests (OPTIONAL)	July-Dec 06	Fully functional, CDAS to SOCC and NOAA to EUMETSAT
6	* Four-Partner System PDR	Oct 05	Tentative?

No.	Item	Schedule (Tentative)	Comment
7	* Four-Partner System CDR	Oct. 06	No date shown in joint schedule ?
8	* Jason-2 Simulator (Presto) available for NPGS interface test.	Dec 06	Presto is the Spacecraft simulator, located at CNES
9	Wallops CDAS Upgrade Integration & Test Complete	Sep 06-Jan 07	Fully functional with SOCC Back-up.
10	Fairbanks CDAS Upgrade Integration & Test Complete	Nov 06-Jan 07	Fully functional
11	SOCC Upgrade Integration & Test Complete	Sep 06-Jan 07	Fully functional
12	* Four-Partner Integrated System Review	Jan 07	Review of the 4 Partner Functional Interface tests ?
13	* Product Processing System (JSDS) Delivery to NOAA	Apr 07	From CNES
14	ESPC Data Processing System (JSDS) Integration &Test Complete (OPTIONAL)	Apr-July 07	JSDS functional and Interface to CLASS
15	Interface from ESPC to AAS/CLASS installed	Apr-July 07	Fully functional
16	NPGS Upgrade Integration & Test Complete	Dec 06-Jan 07	NPGS ETE Integrated Verifications (NOAA GTQ)
17	* Ground Tech Qualification (GQT) Four-Partner tests	Sep-Dec 06	Functional (SOCC & CDAS) Interface Test among 4 Partners
18	* Joint System (Four-Partners) End-to-end V&V Complete	Jan- Dec 07	Jason-2 System ETE V&V with 4 partners
19	Government System Acceptance Complete	Aug 07	ALL NPGS H/W and S/W installed and all V&V completed.
20	Contractor Maintenance Support	Acceptance to Launch + 365 days	Maintenance of the installed operational H/W and S/W, and Upgrades as requested.

Attachment-A - List of Acronyms

AAS	Archive and Access System
AD	Applicable Document
AMR	Advanced Microwave Radiometer
C&A	Certification & Accreditation
C2	Command & Control
CCI	Centre de Controle Instruments
CCSDS	Consultative Communications Committee for Space Data Systems
CDAS	Command and Data Acquisition Station
CDR	Critical Design Review
CDRL	Contract Deliverable Requirement List
CLASS	Comprehensive Large Array-data Stewardship System
CM	Configuration Management
CMP	Configuration Management Plan
CMA	Centre Mutli-missions Altimetre
CMMI	Cability Maturity Model Integration
CNES	The Centre National D'Etudes Spatiales
COTR	Contracting Officer's Technical Representatives
COTS	Commercial Off the Shelf
CTE	Command Transmit Equipment
DCN	Data Communications Network
DORIS	Doppler Orbitography and the Radiopositioning Integrated by Satellite
DMP	Documentation Management Plan
DP	Data Processing
ET	Earth Terminal
ETE	End-to-end
ESPC	Environmental Satellite data Processing Center
EUMETSAT	European Organisation for the Exploration of Meteorological Satellites
FCDAS	Fairbanks Command and Data Acquisition Station
GDR	Geophysical Data Record
GFE	Government Furnished Equipment
HCI	Human Computer Interface
ICD	Interface Control Document
IF	Intermediate Frequency
IJPS	Initial Joint Polar System
IRD	Interface Requirements Document
ISO	International Organization for Standardizations
IT	Information Technology
JPL	Jet Propulsion Laboratory/NASA
JSEQ	Jason Sequencing Subsystem
JTCCS	Jason Telemetry, Command and Control Subsystem
JSDS	Jason Science Data Processing Subsystem

L	Launch
LAN	Local Area Network
LEOP	Launch and Early Orbit Phase
LRA	Laser Retroreflector Array
MMI	Man-Machine Interface
MPSS	Mission Planning and Scheduling Subsystem
MTS	Mitretek Systems
NASA	National Aeronautics and Space Administration
NESDIS	National Environmental Satellite, Data, and Information Service
NOAA	National Oceanic and Atmospheric Administration
NPGS	NOAA Polar Ground Segment
NRT	Near Real Time
NRTDPS	Near Real Time Data Processing System
NRZ	Non-return-to-zero
OBS	On-board Software
OGDR	Operational Geophysical Data Record
OSD	Office of Systems Development
OSDPD	Office of Satellite Data Processing & Distribution
OSO	Office of Satellite Operations
OSTM	Ocean Surface Topography Mission
PACS	Polar Acquisition and Control Subsystem
PDR	Preliminary Design Review
POES	Polar-orbiting Operational Environmental Satellite
POP	Period of Performance
PROTEUS	Plateforme Reconfigurable pour l'observation les Telecommunications et les Usages Scientifiques
QA	Quality Assurance
QAP	Quality Assurance Plan
RD	Reference Documents
SDB	Satellite Database
SDD	System Description Document
SOCC	Satellite Operations Control Center
SOMS	Satellite Operation Management Subsystem
SOW	Statement of Work (SOW)
SRR	System Requirements Review
TBC	To Be Confirmed
TBD	To Be Determined
TBS	To Be Supplied
TBW	To Be Written
TC	Telecommand
TCP/IP	Transmission Control Protocol/Internet Protocol
TIM	Technical Interchange Meeting
TM	Telemetry

TOPEX	Ocean Topography Experiment
UTC	Universal Time Coordinated
V&V	Verification and Validation
WCDAS	Wallops Command and Data Acquisition Station

APPENDIX-B – Additional Security Requirements

(NOAA OSO Network Security Requirements)

These are the requirements for OSO's acceptance of the proposed OSTM architecture design as it relates to the connection to networks that are external to OSO's control by use of firewalls. The term "external networks" will be used throughout to indicate networks external to OSO's control. These are strictly OSO's requirements and they do not imply consent to violate any existing regulations regarding the connection of NOAA or Air Force networks to external networks.

1. The minimum numbers of connections will made and, as much as practical, co-located.

2. All firewalls that connect to external networks will be monitored for intrusions on a 24 x 7 basis and the monitoring will be done on every external network connection by resources responsible to OSO, regardless of whether the remote side of the connection is monitored. Software and hardware will be provided to monitor any internal firewalls.

3. A comprehensive agreement will be reached, between all parties, before any external network connections are made, that outlines, in detail, what steps will be taken in the event that an intrusion is detected, including disconnecting the external connection to protect satellite operations.

4. Any connection to an external network will be protected by at least two layers of firewalls. The firewalls at each connection point will be of different manufacture and use different software. OSO will have the option of keeping the interior of the pair under OSO control exclusive of the NOC. OSO will have final authority over the choice of the brand of firewalls to be used prior to installation and over any future replacements. All firewalls selected will be "intelligent" firewalls also known as "stateful inspection" type.

5. All data interchanges with external networks will be documented before any such connection is made. The description will include the protocol to be used, addresses and designations of the destination and source nodes, port numbers and data format. The anticipated time of the connection or the conditions under which the connection will be made, as appropriate will be provided. In addition to any other information that may be required to further characterize this connections so that only they will be allowed. Protocols or applications that allow general access to any systems will not be allowed such as Telnet, SSH, rsh, rcp, rlogin, RPC, NFS. Network routing protocols and network management protocols such as SNMP will also not be allowed to go between internal and external networks. This is not intended to be an exhaustive list.

6. The network security devices will be configured so that only the documented data exchanges will be allowed through the connections to external networks. ONLY essential connections will be allowed. Under no circumstances will connections be allowed for the convenience of anyone. A specific description of the need for the data exchange will be included. The designated ports on target systems will be blocked when not in use.

7. A signed agreement between ESPC, OSD and OSO will be made prior to any connection that will state that no added connectivity or configuration change will be allowed without the signed consent of the director or deputy director of the Office of Satellite Operations to any device that controls access to an operational network from an external one. The agreement should also state that any change that is made without such consent will be considered an attempt to breech network security and reported as such to NOAA and/or other security authorities. The agreement will also describe the process for authorizing changes to the configuration including a required lead time to consider the request and thoroughly test the change.

8. All systems installed will already meet NOAA security standards and all acceptance tests will be conducted from individual accounts created with the minimum of required access and privileges. Such accounts will be created at the time of acceptance testing.

9. Any internal systems that process data, whether part of this installation or not, which will be accessed from an external network will have software installed to assure their data integrity. Such systems will also have intrusion detection system (IDS) software protecting them.

10. The Contractor shall:

- Provide monitoring on a 24X7 basis for all external networks for intrusions and every external network connection
- Provide software and hardware to monitor the NOAA owned firewalls
- Not make any physical or logical connections to other networks until authorized by the Government
- Sign and follow the agreement outlined in number 3 of this Appendix
- Provide a firewall solution compliant with the requirements identified in this Appendix